REMARKS

This is in full and timely response to the Office Action mailed July 8, 2002. Reexamination and reconsideration in light of the above amendments and the following remarks is respectfully requested.

By the foregoing amendment, claim 2 was amended to recite that the maximum benefit router [separates the]determines the best routing objective of the calling party according to call topics. Support for this amendment can be found variously throughout the specification, for example, at paragraph 0008. Claim 3 was amended to recite that the maximum benefit router [separates]determines the best routing destination based on the routing objective of the calling party distinguished from a second routing objective of a call center." Support for this amendment can be found variously throughout the specification, for example, at paragraph 0009. Claim 4 was amended to further define the m x n matrix such that claim 4 recites "having m rows and n columns forming an m x n matrix and where m represents routing destinations and n represents caller topics." Support for this amendment can be found variously throughout the specification, for example, at Table 1 and Fig. 3. Claims 2-4 were not amended to overcome any applied or cited art, and no prohibited new matter was added. Claim 16 was amended to incorporate the elements of claim 19, and claim 19 was canceled without prejudice or disclaimer. Claims 1-18 and 20 are currently pending for the Examiner's reconsideration, with claims 1, 14 and 16 being independent.

Claim Objections

Claim 4 is objected to by the Examiner alleging the informality of "m x n". Applicants respectfully disagree.

Claim 4 recites in part "wherein the at least one predetermined parameter is selected from an m x n benefit matrix having m routing destinations and n caller topics." Describing a two-dimensional matrix as "m x n" is a common notation. This is evidenced by the primary applied reference, U.S. Patent No. 6,269,153 at col. 4, lines 54-65.

However, in order to advance prosecution, Applicants have amended claim 4 to recite "having m rows and n columns forming an m x n matrix and where m represents routing destinations and n represents caller topics." Withdrawal of this objection is respectfully requested.

Rejections under 35 U.S.C. §112

Claims 2 and 3 are rejected under 35 U.S.C. §112, second paragraph. Regarding claims 2-3, the Office Action alleges that the phrase "separates the routing objective" is unclear.

In order to expedite prosecution, Applicants have amended claim 2 to recite "wherein the maximum benefit router [separates the]determines the best routing objective of the calling party according to call topics." Withdrawal of this rejection is respectfully requested.

Additionally, in order to expedite prosecution, Applicants have amended claim 3 to recite that the maximum benefit router [separates]determines the best routing destination based on the routing objective of the calling party distinguished from a second routing objective of a call center." Withdrawal of this rejection is respectfully requested.

Claim 15 was rejected under 35 U.S.C. §112, second paragraph, alleging that electronic mail is not a call. Applicants respectfully traverse this rejection.

Claim 15 recites that the call of claim 14 can be one of a telephone call and electronic mail. Applicants' specification does not limit a call to "a telephone call." The specification clearly states that "It will be understood that speech utterances can be either analog ...or they can be digital, for example, typed on a keyboard." See Specification at paragraph 0024. An example

of electronic mail is a message typed on a keyboard. Well known examples of devices that generate electronic messages are teletypewriters (TTY) and Telecommunication Devices for the Deaf (TDD). Since voicemail messages can be stored in analog or digital format, the definition of "mail" can be interchangeable with "message," or "call," or even more generically, "communication."

Accordingly, as this limitation and definition is fully supported within the specification, withdrawal of this rejection is respectfully requested.

Rejections under 35 U.S.C. §102

Claims 1-8, 11, 14 and 15-20 are rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 6,269,153 to Carpenter et al. Applicants respectfully traverse this rejection.

Claim 1 recites an automated call routing system that routes a telephone call by responding to a routing objective of a calling party, comprising: a speech recognizer that determines at least one phrase from a speech utterance made by the calling party and outputs a digital phrase; a topic identifier that receives the digital phrase and converts the digital phrase to at least one of a word stem and a word class and generates a topic output; and a maximum benefit router that receives the topic output and determines where to route the telephone call in order to optimize at least one predetermined parameter.

Claim 14 recites an automated call routing system that routes a call by responding to a routing objective of a calling party, comprising: a recognizer that determines at least one phrase made by the calling party and outputs a second phrase; a topic identifier that receives the second phrase and converts the second phrase to at least one of a word stem and a word class and generates a topic output; and a maximum benefit router that receives the topic output and determines where to route the call in order to optimize at least one predetermined parameter.

Carpenter et al. '153 discloses methods and apparatus for call routing whereby a caller's response to a routing question is used to direct the call to a destination, and storing and processing caller contributions to each call. If the caller's response does not allow for unambiguous routing, the routing system poses clarifying questions to the caller, and these

additional responses are used to refine the query for use in a subsequent attempt to rout the call. The primary objective of Carpenter et al. '153 is to eliminate ambiguity of the caller's routing request in order for the routing module to be able to route the call appropriately.

The Office Action alleges that item 412 of Carpenter et al. '153 is a maximum benefit router. This is incorrect. Carpenter clearly discloses that "The selection processor 412 compares the query-document score for each of the documents against a threshold for exactly one document, the routing module routes the call to the destination associated with the document whose score meets the threshold. If the query-document score meets the threshold for more than one document, the query is ambiguous, and the call is transferred to the disambiguation module 208." See col. 8, lines 59-67. Accordingly, the selection processor is determining if there is one unique destination that satisfies the document score, and if not, returns the query for additional information from the caller. This results in the call being routed only when there is a one to one correlation between the query-document score and a destination. Thus, Carpenter et al. '153 does not determine where to route a call based on maximum benefit. The score of the query-document is not a maximum benefit parameter.

In contrast, claims 1 and 14 both require a maximum benefit router that receives the topic output and determines where to route the call in order to optimize at least one predetermined parameter. As disclosed in the specification, for example, at paragraph [0010], a maximum benefit router

> routes telephone calls based on the caller's goals and/or the benefit of routing callers to a customer care center most appropriate for retrieving a valid answer for the caller. In general, the cost or benefit is based on the fastest and least expensive way to answer a query posed by a caller. Using a probabilistic model of the caller's goals or call-topics based on a response to a top-level prompt, and a set of functions associating a utility or benefit with routing those call-topics to destinations within the center, the utility or benefit is measured according to a measurable criteria such as agent time saved. The invention selects the destination for each call that will have the maximum expected benefit. Stated simply, for example, when a caller has a question about billing, the call is best routed to a person who has special knowledge about billing, and most likely can answer the billing question in the shortest amount of time. If the billing question was routed to a person having special knowledge about, for example, installation, it most likely would take more time to answer a billing question, and the answer might not be as accurate. In this manner, questions about billing are routed to a person best equipped to

answer the question according to the measured criteria, thereby freeing up a specialist that can answer installation questions from another call inquiring about installation.

Accordingly, the maximum benefit router is not disclosed, taught or suggested by Carpenter et al. '153.

Claim 16 recites a method for automatically routing a telephone call using maximum benefit routing, comprising the steps of: receiving a telephone call from a caller; determining phrases from speech utterances by a caller; inputting said determined phrases to a speech recognizer device; converting said recognized determined phrases into at least one of word stems and word classes; performing keyword lookup on the one of word stems and word classes; generating a feature vector that contains the number of times the at least one word stems and word classes were found in the determined phrase; performing analysis on the feature vector; outputting a posterior possibilities vector; inputting the posterior possibilities vector and determining the expected benefit of routing the call to each of a predetermined destination; and outputting a benefit sorted vector of destinations, benefits and topic scores.

As disclosed in the specification at paragraph [0033] – [0035], for example,

[0033] In the preferred embodiment, a call center 32 can be described as having L routing destinations, d_i, and N caller topics, t_j. Maximum benefit routing determination program 30 takes as input an L x N benefit matrix, B, and an N-dimensional topic-likelihood vector, $\mathbb{t}$, where
$\mathbb{t}$ = P(Topics | Words).
Maximum benefit routing determination program 30 then generates an L-dimensional vector, $\mathbb{b}$, where
$\mathbb{b}$=Benefit(Destinations | Words),
the expected benefits as output.

[0034] The benefit matrix, B, is generated by a person familiar with the costs of handling calls in call center 32. The rows of B represent the destinations for calls, while the columns represent the topics that a caller inquiry may contain. The entries of B define the benefit in seconds of agent time saved by routing to destination d_i when the caller's topic is t_j, or benefit($d_i \mid t_j$) = b_{ij}.

[0035] The caller's topics could be numerous and unwieldy, so a probabilistic topic spotter, or topic identification program 28, is used to generate a topic-likelihood vector, t. The entries for this vector, t_i, express the probability that the topic, random variable, t, of the call is t_i, given the evidence, $Pr\{t = t_i \mid e\}$. Here, the evidence is the string of words, e = *Words* =$word_1$, $word_2$,...$word_n$, that was recognized by speech recognizer 22 from the caller's response to an open-ended prompt. Maximum benefit routing

determination program 30 then calculates an output vector, $\mathbb{b} = \mathbb{B}\mathbb{t}$, which contains the expected benefits of routing caller 12 to destinations 32 given their utterance 16, such that

$$Benefit\langle d_i \,|\, Words\rangle = \varepsilon\langle benefit\langle d_i \,|\, t\rangle \,|\, Words\rangle = \sum_{j=1}^{N} benefit\langle d_i \,|\, t_j\rangle \Pr\langle t = t_j \,|\, Words\rangle .$$

Thus, the posterior possibilities vector $\mathbb{t}$ = P(Topics | Words) is input into the maximum benefit routing determination program 30 for calculation of an output vector $\mathbb{b} = \mathbb{B}\mathbb{t}$.

The Office Action alleges that the vector disclosed in Carpenter et al. '153 at column 5, lines 39-63 discloses that the posterior possibilities vector is output, that this vector is then input into the maximum benefit router to determine the expected benefit of routing the call to each of a predetermined destination, and the resulting output is a benefit sorted vector of destinations, benefits and topic scores. As discussed above, this is incorrect, as the maximum benefit router is not disclosed, taught or suggested by Carpenter et al. '153.

A document can only anticipate a claim if the document discloses, explicitly or implicitly, each and every feature recited in the claim. Verdegall Bros. v. Union Oil Co. of Calif., 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). Since Carpenter et al. '153 fails to disclose, teach or suggest, either explicitly or implicitly, at least the above-noted feature recited in independent claims 1, 14 and 16, Carpenter et al. '153 cannot anticipate the claims. At least in view of the foregoing, claims 1, 14 and 16 are allowable, and the rejection should be reconsidered and withdrawn.

Claim 3 recites the additional element of determining the best routing destination based upon the routing objective of the calling party distinguished from a second routing objective of a call center. As discussed above, Carpenter et al. '153 does not disclose, teach or suggest routing a call based upon the routing objective of the calling party distinguished from a second routing objective of a call center.

Claim 7 recites the additional element wherein entries in the benefit matrix define the benefit in seconds of agent time saved by routing the call to a first destination based upon a caller topic. The Office Action at page 6, lines 5-9 alleges that this is disclosed in Carpenter et al. '153 at col. 2, lines 56-65. However, all that is disclosed in the reference is the routing of a call after the voice response is analyzed to an appropriate location, and if indeterminate, routing the call to

a person. Carpenter et al. '153 does not disclose, teach or suggest that entries in the benefit matrix define the benefit in seconds of agent time saved by routing the call to a first destination based upon a caller topic.

Claim 8 recites the additional element wherein the maximum benefit router routes the telephone call based upon at least one of optimized time savings, optimized cost savings, optimized response quality and optimized resources. Rather, Carpenter et al. '153 teaches determining the caller topic for comparing to a predetermined list of routing terms, and does not disclose, teach or suggest routing a call based upon at least one of optimized time savings, optimized cost savings, optimized response quality and optimized resources.

Claim 17 recites the additional elements wherein the analysis is performed on the feature vector using one of a multinomial model, a generalized linear model and a support vector machine. Carpenter et al '153 discloses at col. 5, lines 39 – 63 that the term-frequency matrix 310 is normalized, and then divided by its length to create a normalized matrix. However, Carpenter et al. '153 does not disclose, as alleged by the Office Action, teach or suggest that the analysis is performed on the feature vector using one of a multinomial model, a generalized linear model and a support vector machine.

Claim 20 recites the step of whether to route the call to a top ranking destination or to reject the utterance if the topic score and/or benefit falls below a predetermined threshold. As discussed above, Carpenter et al. '153 does not disclose, teach or suggest a benefit, and therefore cannot route a call based upon whether a benefit score falls below a predetermined threshold.

Still further, claims 2-8 and 11, being dependent upon claim 1, claim 15, being dependent upon claim 14, and claims 17, 18 and 20, being dependent upon claim 16, are also allowable for the reasons above. Moreover, these claims are further distinguished by the materials recited therein, particularly within the claimed combination. Withdrawal of the §102(e) rejection is therefore respectfully solicited.

Rejections under 35 U.S.C. §103

Claims 9 and 10 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,269,153 to Carpenter et al. in view of U.S. Patent No. 6,349,307 to Chen. Applicants respectfully traverse this rejection.

Chen '307 discloses the use of Baysian decision theory to determine the likelihood factor based on the accuracy of each determination. See col. 5, lines 36 – 51. However, Chen '307 does not disclose, teach or suggest the use of Baysian decision theory to optimize at least on predetermined parameter of the maximum benefit router and determining the overall risk, as recited in claim 9. Accordingly, Chen '307 does not make up for the deficiencies of Carpenter et al. '153, and a prima facie case of obviousness has not been established. Similarly, claim 10 recites that the minimum overall risk is the maximum benefit, which is not disclosed, taught or suggested by Chen '307 or Carpenter et al. '154, and Chen '307 does not make up for the deficiencies of Carpenter et al. '153, and a prima facie case of obviousness has not been established.

Still further, claims 9 and 10, being dependent upon claim 1, is also allowable for the reasons above. Moreover, this claim is further distinguished by the materials recited therein, particularly within the claimed combination. Withdrawal of the §103(a) rejection is therefore respectfully solicited.

Claims 12 and 13 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,269,153 to Carpenter et al. in view of U.S. Patent No. 6,349,307 to Chen. Applicants respectfully traverse this rejection. By the wording of this rejection, Applicants believe that the Examiner meant to reject claims 12 and 13 under §103 as being unpatentable over Carpenter et al. '153 in view of U.S. Patent 6,295,533 to Cohen. Applicants respectfully traverse this rejection.

Cohen '533 discloses a system and method for accessing heterogeneous databases. The system is used to answer queries concerning information stored in the database. Cohen '533 does not disclose, teach or suggest maximum benefit routing as recited in the claims, rather, this reference is applied solely for disclosing a Porter stemming algorithm. Cohen '533 does not

make up for the deficiencies of Carpenter et al. '153, and a prima facie case of obviousness has not been established.

Still further, claims 12 and 13, being dependent upon claim 1, is also allowable for the reasons above. Moreover, this claim is further distinguished by the materials recited therein, particularly within the claimed combination. Withdrawal of the §103(a) rejection is therefore respectfully solicited.

Conclusion

For the foregoing reasons, claims 1 – 18 and 20 are allowable, and claims 1-18 and 20 are in condition for allowance, and the application is in condition for allowance. Accordingly, favorable reexamination and reconsideration of the application in light of these amendments and remarks is courteously solicited. If the examiner has any comments or suggestions that would place this application in even better form, the Examiner is requested to telephone the undersigned attorney at the number below.

Respectfully submitted,

Date: 10/3/2002

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Should additional fees be necessary in connection with the filing of this paper, or if a petition for extension of time is required for timely acceptance of same, the Commissioner is hereby authorized to charge Deposit Account No. 07-2339 for any such fees; and applicant(s) hereby petition for any needed extension of time.

Appendix I

In accordance with 37 CFR 1.121 (c)(1)(ii), amended claims 2-4 and 16 are set forth in a marked-up version below:

2. (Amended) The automated call routing system of claim 1, wherein the maximum benefit router [separates the]determines the best routing objective of the calling party according to call topics.

3. (Amended) The automated call routing system of claim 1, wherein the maximum benefit router [separates]determines the best routing destination based on the routing objective of the calling party distinguished from a second routing objective of a call center.

4. (Amended) The automated call routing system of claim 1, wherein the at least one predetermined parameter is selected from an m x n benefit matrix having m rows and n columns forming an m x n matrix and where m represents routing destinations and n represents caller topics.

16. (Amended) A method for automatically routing a telephone call using maximum benefit routing, comprising the steps of:

receiving a telephone call from a caller;

determining phrases from speech utterances by a caller;

inputting said determined phrases to a speech recognizer device;

converting said recognized determined phrases into at least one of word stems and word classes;

performing keyword lookup on the one of word stems and word classes;

generating a feature vector that contains the number of times the at least one word stems and word classes were found in the determined phrase;

performing analysis on the feature vector; [and]

outputting a posterior possibilities vector;

inputting the posterior possibilities vector and determining the expected benefit of routing the call to each of a predetermined destination; and

outputting a benefit sorted vector of destinations, benefits and topic scores.